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TRANSMITTAL FORM

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Application Number	10/655,901
Filing Date	09/05/2003
First Named Inventor	Youichi Akasaka
Art Unit	3663
Examiner Name	Deandra M. Hughes
Attorney Docket Number	2460

ENCLOSURES *(Check all that apply)*

- ☐ Fee Transmittal Form
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- ☐ Amendment / Reply
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- ☐ Response to Missing Parts/ Incomplete Application
  - ☐ Reply to Missing Parts under 37 CFR 1.52 or 1.53
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- ☒ Appeal Communication to TC **(Appeal Notice, Brief, Reply Brief)**
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Remarks

It is believed that no fees are due in this matter. However, if it is determined that fees are due, the Commissioner is authorized to debit Deposit Account No. 210765 for the required fees.

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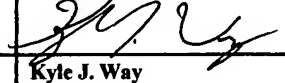
Signature			
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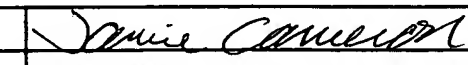
Signature			
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Practitioner's Docket No. 2460 *PATENT*

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Youichi Akasaka
Application No.: 10/655,901
Filed: September 5, 2003
For: DISTRIBUTED RAMAN AMPLIFICATION

Confirmation No.: 7660
Group No.: 3663
Examiner: Deandra M. Hughes

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P.O. Box 1450
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REPLY BRIEF

Introductory Comments

In response to the examiner's answer dated June 26, 2006 (hereinafter "the examiner's answer"), please consider the following remarks.

Remarks

Claims 1, 4-11 and 14-20 stand rejected and remain pending. The Assignee respectfully requests reversal of the rejections in light of the appeal brief filed May 2, 2006 (hereinafter "the appeal brief") and in view of the comments set forth below.

Claims 1, 4, 11 and 14 stand rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,344,922 to Grubb et al. (hereinafter "Grubb") in view of C.R.S. Fludger, V. Handerek and R.J. Mears, "Pump to signal RIN transfer in Raman fibre amplifiers," *Electronics Letters*, vol. 37, no. 1, pp. 15-17 (January 4, 2001) (hereinafter "Fludger"). (Page 2 of the final Office action.) Also, claims 5, 6, 8, 15, 16 and 18 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Grubb in view of Fludger and U.S. Patent No. 6,603,593 to Fidric et al. (Page 4 of the final Office action.) Claims 7, 9, 10, 17, 19 and 20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Grubb in view of Fludger and "Fiber-Optic Communication Systems" by Agrawal. (Page 4 of the final Office action.)

To aid in the following discussion, independent claim 1 is repeated below, with emphasis supplied:

> 1. A communication system for distributed Raman amplification of optical signals, the communication system comprising:
> a first fiber span;
> a second fiber span;
> a third fiber span;
> a first pump system configured to generate and transmit a first light beam;
> *a first splitter configured to receive the first light beam, split the first light beam into a first portion of the first light beam and a second portion of the first light beam, transfer the first portion of the first light beam onto the first fiber span to backward propagate over the first fiber span, and transfer the second portion of the first light beam onto the second fiber span to forward propagate over the second fiber span;*
> a second pump system configured to generate and transmit a second light beam; and
> *a second splitter configured to receive the second light beam, split the second light beam into a first portion of the second light beam and a second portion of the second light beam, transfer the first portion of the second light beam onto the second fiber span to backward propagate over the second fiber span, and transfer the second portion of the second light beam onto the third fiber span to forward propagate over the third fiber span;*

wherein a power of the first portion of the first light beam is not equal to a power of the second portion of the first light beam; and

wherein a power of the first portion of the second light beam is not equal to a power of the second portion of the second light beam.

Independent method claim 11 provides similar limitations.

Fludger Does Not Teach or Suggest Unequal Powers for the First and Second Portions of a Light Beam

In the appeal brief, several arguments are presented on behalf of the Assignee as to why Fludger does not teach or suggest unequal powers for the first and second portions of each of the first and second light beams of claims 1 and 11. (Pages 7 and 8 of the appeal brief.) As indicated in the appeal brief, Fludger discusses the effects of pump propagation direction on relative intensity noise (RIN) transfer characteristics of Raman amplifiers, but only in systems that provide strictly forward-pumped or reverse-pumped configurations, and not in systems that pump in the forward and reverse directions simultaneously. Fludger does not consider the possibility of a system that pumps in both directions over a particular fiber span at all, much less the effect of such a system on RIN.

In response, the examiner's answer indicates that "*simultaneous* forward and backward pumping is not claimed." (Page 7 of the examiner's answer; emphasis in original.) While the word "simultaneous" is not employed in the language of claims 1 and 11, these claims, in conjunction with the summary and detailed description, clearly indicate that the first and second pump systems, in conjunction with the first and second splitters, operate to pump in the forward and reverse directions over the second fiber span at the same time. As stated in the present application, one of the benefits of such a system is that "[s]plitting the light beam into portions may advantageously reduce the local pump power being injected into the fiber spans while still providing the desired gain. The lower local pump power may be safer for the operators of the communication system." (Page 4, lines 8-10.) In other words, each end of a fiber span is injected with a lesser power than if all of the power were injected into one end. As a result, if the

forward and backward pumping were not simultaneous, the desired gain would not be provided.

Also, for the forward and reverse pumping over the second fiber span to not be simultaneous, the first pump system would have to be off while the second pump system was on, and vice-versa. No indication is provided in claims 1 and 11, or in the current application, that such operation occurs.

Moreover, as discussed in greater detail below, claims 1 and 11 explicitly provide for uneven portions *of the first light beam* as provided by the first splitter, the portions being transferred over different fiber spans. The same is true regarding the second light beam and the second splitter. As a result, the two portions of the same beam must be present at the same time, as the splitters of the current application do not selectively shut off one portion or another. In other words, if the pump system is supplying a light beam to the splitter, both portions of the light beam from the splitter exist simultaneously.

Further, the Assignee respectfully notes that while the arguments provided in the appeal brief in support of claims 1 and 11 were also present in the response (dated April 6, 2006) to the final Office action of February 10, 2006 (hereinafter "the final Office action"), the examiner's response appears to be the first time that this latest assertion regarding a lack of claiming of simultaneous forward and backward pumping has appeared.

Uneven Split of a Single Light Beam

As mentioned above, claims 1 and 11 provide explicitly for the two portions of the same light beam to be unequal. The examiner's answer asserts that "an 'uneven split of single light beam' is not claimed." (Page 7 of the examiner's answer.) The Assignee respectfully disagrees. While those exact words do not appear in claims 1 and 11, these claims specifically provide for each of the two splitters to receive a light beam and split the beam into first and second portions, wherein the first portion is not equal in power to the second portion. Thus, an uneven split of each of the first and second light beams is necessarily provided in claims 1 and 11.

The examiner's answer also indicates that the final Office action shows that Grubb teaches "the splitting of the light beams, and power variations of the pump beam

(see pg. 3, lines 3-5 and line 12 of Final Office Action dated 2/10/06)." (Page 7 of the examiner's answer.) However, even if the pump power is varied, the portions of the beam after splitting *will still be equal in power*. In other, a splitter that splits an incoming beam in half will still split the beam in half regardless of the power of the incoming beam. For example, if the power of the incoming beam is reduced by 20 percent, each portion of the beam that exits the splitter will be reduced by 20 percent as well, so that the portions of the beam will still remain equal. Thus, Grubb does not teach or suggest unequal splitting of a single light beam.

The examiner's answer also indicates that "applicant's statement that 'Fludger is focused on determining RIN over a single fiber span...' is simply incorrect," and cites several references in Fludger regarding RIN in systems with multiple spans. (Pages 7 and 8 of the examiner's amendment.) However, the specific testing discussed in Fludger, and thus the particular system focused upon therein, consisted of examining "the effect of RIN in a strong pump beam *traveling in a singlemode optical fibre*, either with or against the direction of a co-existing weak signal beam of a different optical wavelength." (Last paragraph of left column of page 16; emphasis supplied.) Fludger then indicates generally that "RIN transfer will accumulate linearly as the number of spans increases." (Page 17, left column, lines 4 and 5.)

However, the salient point being made in the appeal brief is that Fludger does not teach or suggest splitting a beam, the resulting portions of which are directed onto different fiber spans. Instead, the light from the Raman pump of Fludger is *directed onto a single fiber span*, not onto two different spans in opposite directions. Instead, Fludger specifically discusses RIN on a single fiber span, and then notes the effect on RIN as more fiber spans are added serially to the system, each of which is pumped in the same direction. For example, Fludger states that "[T]en spans of co-pumped distributed Raman amplifiers with a pump RIN of -110db/Hz will show almost 1dBQ penalty." (Page 17, left column, lines 5-7.) As a result, Fludger does not teach or suggest directing *unequal* portions of a light beam onto two different fiber spans, as specified in claims 1 and 11.

Conclusion

In light of the arguments presented in the appeal brief, as supplemented by the additional remarks presented above, the Assignee respectfully requests that the rejection of claims 1, 4-11 and 14-20 be reversed.

The Assignee believes no additional fees are due with respect to this filing. However, should the Office determine additional fees are necessary, the Office is hereby authorized to charge Deposit Account No. 21-0765 accordingly.

Respectfully submitted,

Date: 7/25/06

SIGNATURE OF PRACTITIONER

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